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R E P O R T

OF THE

THIRTEENTH ROCKY MOUNTAIN CONFERENCE OF ENTOMOLOGISTS

CENTENNIAL, WYOMING

August 16 to 21, 1936

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Report of the Thirteenth Rocky Mountain Conference of Entomologists, University of Wyoming, Summer Camp, Centennial, Wyo., August 16 to 21, 1936

Edited by Geo. M. list, Secretary

The small but steady increase in numbers attending the Rocky Mountain Conference continues. A total of 98 enrolled at the Wyoming Summer Camp during the week. A majority of these reached camp Sunday the 16th. Some coming from a distance had stayed over night in either Fort Collins, Colorado, or Laramie, Wyoming, and found it only a nice early morning drive into camp. In all 18 states were represented.

The following is a list of those in attendance:

Parker, J. R.	Bozeman, Montana
Butcher, Fred D.	Bozeman, Montana
Mabee, W. B.	Glasgow, Montana
Bigger, J. H.	Jacksonville, Illinois
Bigger, Mrs. J. H.	Jacksonville, Illinois
Bigger, Jack	Jacksonville, Illinois
Corkins, Frances M.	Powell, Wyoming
Corkins, C. L.	Powell, Wyoming
Clarke, Dr. L. Floyd	Laramie, Wyoming
Clarke, Mrs. L. Floyd	Laramie, Wyoming
Farrar, Mrs. C. L.	Laramie, Wyoming
Farrar, C. L.	Laramie, Wyoming
Gilbert, C. H.	Laramie, Wyoming
Owen, Wm. B.	Laramie, Wyoming
Owen, Mrs. Wm. B.	Laramie, Wyoming
Sturtevant, A. C.	Laramie, Wyoming
Scott, J. W.	Laramie, Wyoming
Scott, Mrs. J. W.	Laramie, Wyoming
Scott, Margaret	Laramie, Wyoming
Scott, Marion	Laramie, Wyoming
Woodrow, A. W.	Laramie, Wyoming
Woodrow, Alice	Laramie, Wyoming
Davis, J. J.	Lafayette, Indiana
Davis, Madge K.	Lafayette, Indiana
Fluke, C. L.	Madison, Wisconsin
Fenton, F. A.	Stillwater, Oklahoma
Gates, Leroy M.	Lincoln, Nebraska
Gates, Mrs. Leroy M.	Lincoln, Nebraska
Gates, Glen L.	Lincoln, Nebraska
Wade, Otis	Lincoln, Nebraska
Wade, Marian	Lincoln, Nebraska
Haseman, Wilber C.	Columbia, Mo.
Haseman, Mrs. Leonard	Columbia, Mo.
Haseman, Leonard	Columbia, Mo.
Haseman, Jessie	Columbia, Mo.
Voris, Ralph	Springfield, Mo.
Voris, Mrs. Ralph	Springfield, Mo.
Hamlin, J. C.	Salt Lake City, Utah
Hamlin, Mrs. J. C.	Salt Lake City, Utah
Hamlin, Anne	Salt Lake City, Utah
Hamlin, Jean	Salt Lake City, Utah

Reeves, George I.	Salt Lake City, Utah
Stanford, J. S.	Logan, Utah
Sorenson, C. J.	Logan, Utah
Henderson, W. W.	Logan, Utah
Kelly, E. G.	Manhattan, Kansas
Kelly, Mrs. E. G.	Manhattan, Kansas
Phillips, Mrs. L. O.	Winfield, Kansas
Painter, Reginald H.	Manhattan, Kansas
Palmer, Mary	Lawrence, Kansas
Post, R. L.	Rochester, N. Y.
Post, Nellie M.	Rochester, N. Y.
Richardson, Howard	Ames, Iowa
Richardson, G. H.	Ames, Iowa
Richardson, Jeannette	Ames, Iowa
Richardson, Adelaide	Ames, Iowa
Schoene, W. J.	Blacksburg, Virginia
Schoene, Mrs. W. J.	Blacksburg, Virginia
Schoene, Margaret	Blacksburg, Virginia
Schoene, Willena	Blacksburg, Virginia
Severin, H. C.	Brookings, South Dakota
Severin, Mrs. H. C.	Brookings, South Dakota
Severin, Lawrence	Brookings, South Dakota
Stitt, Loyd L.	Tempe, Arizona
Stitt, Marydea L.	Tempe, Arizona
Parten, H. L.	Minnesota, Minn.
Parten, Vine	Minnesota, Minn.
Parten, Vincent	Minnesota, Minn.
Hitchcock, John D.	Laramie, Wyoming
Greenwald, Margaret	Powell, Wyoming
Ostrom, George N.	Sheridan, Wyoming
Shotwell, Robert L.	Bozeman, Montana
Davis, L. G.	Arvada, Colorado
Daniels, Leslie B.	Ft. Collins, Colorado
Daniels, Mrs. L. B.	Ft. Collins, Colorado
Daniels, Rosemary	Ft. Collins, Colorado
Daniels, Donna Lee	Ft. Collins, Colorado
Hoerner, John L.	Ft. Collins, Colorado
Mrs. J. L. Hoerner	Ft. Collins, Colorado
Hoerner, Veda	Ft. Collins, Colorado
Hinkle, Galen A.	Ft. Collins, Colorado
Jones, C. R.	Ft. Collins, Colorado
Jones, Mrs. C. R.	Ft. Collins, Colorado
James, Maurice T.	Ft. Collins, Colorado
Palmer, Miriam A.	Ft. Collins, Colorado
McLaughlin, Eleanor Davis	Arvada, Colorado
McCampbell, Sam C.	Ft. Collins, Colorado
McCampbell, Mrs. Sam C.	Ft. Collins, Colorado
McCampbell, Sam, Jr.	Ft. Collins, Colorado
Heiss, Elizabeth M.	Ft. Collins, Colorado
Maxson, Asa C.	Longmont, Colorado
List, George M.	Ft. Collins, Colorado
Newton, J. H.	Paonia, Colorado
Goodrich, Arthur L.	Manhattan, Kansas
Sisson, Max A.	Denver, Colorado
Reed, Elmer	Fort Collins, Colorado
Rosenbauer, Elvira	Rochester, N. Y.

The first meeting was held at 7:30 in the evening of the 16th. In the absence of C. P. Gillette, Chairman, and Donald A. Wilbur, Vice-chairman, the meeting was called by the Secretary. John W. Scott of the University of Wyoming was made temporary chairman.

The following committees were appointed: Program - C. H. Richardson, H. C. Severin and J. R. Parker; Resolutions - J. J. Davis, J. C. Hamlin and E. G. Kelly; Nominations - C. L. Corkins, L. Haseman and C. L. Fluke. After the introduction of all present Dr. J. W. Scott gave a very interesting discussion of the wild life of the Medicine Bow Mountain region. Dr. S. H. Knight, geologist for the University of Wyoming, told of the local geography and of the many trips that could be taken on foot and by auto from the camp. Dr. Knight, who has been largely responsible for the building of the University Camp, told of its origin and how it had been built largely by student labor. Motion pictures of student camp life were shown. Views of the winter visits to the camp, when the buildings were entirely hidden by snow, were especially interesting.

Monday, August 17, 9 a.m. C. H. Richardson, presiding. The Cairo, Egypt Grasshopper Conference. J. R. Parker, U. S. Department of Agriculture, Bureau of Entomology and Plant Quarantine, Bozeman, Montana. Dr. Parker gave an interesting account of his trip to Egypt as official delegate from the United States to this conference. Experiences in traveling in a foreign country as well as something of the proceedings of the conference were given. The conference discussed, among other things, (a) the need of more accurate and detailed reports from all countries of the damage from grasshoppers, (b) the gregarious and solitary phases of different species, (c) biometric methods, (d) factors controlling outbreaks, (e) survey methods, (f) long time programs of study.

G.M.L.

Reports of 1936 Grasshopper Conditions. F. A. Fenton, Oklahoma Agricultural College, Stillwater. During the crop growing season of 1936 grasshoppers appeared in destructive numbers in 71 of the 77 counties in Oklahoma. Only the south-eastern part of the state escaped. There were four species that caused most of the damage. These were in order of their importance: Melanoplus differentialis, M. mexicanus, M. bivittatus and Dissosteira longipennis. The lesser migratory grasshopper matured first and caused the heaviest early damage to pastures and alfalfa. The differential grasshopper was by far the most numerous and caused the heaviest damage to corn and cotton. The two-striped grasshopper, although universally present was predominant only locally. D. longipennis appeared in swarms in the Panhandle County of Cimarron in mid-August. This species has since spread eastward to include Texas County.

From the pastures and alfalfa the hoppers migrated to small grains and corn. Wheat was not damaged much because it was already ripe, but considerable damage was done to oats by cutting off the heads. The oats soon became too hard for food purposes, and the

insects concentrated on corn and cotton. Little attempt was made to control the insects on corn, since it was already suffering from lack of water, and the prospect for rain was very poor. The fight centered on protecting cotton since this is the most important cash crop, and was not suffering at that time because of the drought.

The state grasshopper control committee consisted of C. F. Stiles, Extension Entomologist, Chairman; F. A. Fenton, State Entomologist; and E. E. Scholl, Director of Extension Division, Assistant extension entomologists were Oren Eastep, Myron Maxwell and R. O. Monosmith. For the research work were Dr. F. E. Whitehead in charge and R. R. Walton, assistant.

The county organization was in charge of the County Agent, assisted by county grasshopper control committees. These were organized in 71 counties and actual committees at work totaled 115. Assisting in the control work were vocational agricultural teachers, men hired by the county commissioners, and CCC boys.

The bait used most generally was a mixture of equal parts of sawdust and bran with sodium arsenite as the poison. Due to scarcity of sawdust in the southwestern part of the state cotton seed hulls were used, mixed equally with the bran with good results. Prior to Federal aid a total of 40,000 lbs. of white arsenic was used in mixing poisons.

The campaign was started July 7 and by August 10 poisoning had stopped due to drought conditions. Poisoning was renewed in late September when the grasshoppers migrated back to the crops from the trees along the creek beds where they had roosted during the intense heat of August.

Crop losses caused by the outbreak were as follows:

Small grains	$1,200,000.00
Corn	1,500,000.00
Truck crops	500,000.00
Tame hay	700,000.00
Wild hay	150,000.00
Pasture	100,000.00
Cotton	3,000,000.00
Total	$7,150,000.00

Cost of Control.

Administrative	$ 1,500.00
Bait furnished by farmers	18,000.00
Bait furnished by U. S.	25,000.00
Total	$ 44,500.00
Value of crops saved	1,000,000.00

F.A.F.

Kansas Conditions 1936. E. G. Kelly. Much land in Kansas had been thrown out of cultivation during 1934 and '35 and developed many weeds and hoppers. The hoppers consisted largely of Melanoplus differentialis, M. mexicanus, and M. bivittatus. The wheat was early enough to avoid serious injury but most all other crops suffered. Delay caused by individuals waiting for government poison delayed the control program.

G.M.L.

Grasshopper Situation in Missouri in 1936. L. Haseman, University of Missouri, Columbia. Not in fifty years have grasshoppers been so abundant in Missouri. In the late summer of 1935 there suddenly appeared a great increase of the mixture of femur-rubrum and mexicanus, due probably to migration. In 1936 these two small species together with M. differentialis and M. bilineata did most of our damage. In corn fields differentialis was most destructive, while in meadows, alfalfa, pastures, and other low crops, the two small species were most numerous. Bilineata was least abundant and was largely found in the western and northern part of the State.

Our fall of 1935 and early spring surveys of 1936 enabled us to accurately map the threatened areas. Substantially our 1934 state and county chinch bug committees were intact for controlling grasshoppers and the work was under way when the federal bait was made available in Missouri. Fifty-five cars of bran and four cars of poison were allotted to Missouri and some 60 counties in the western half of the state, where hoppers were destructive, received the federal bait. Unfortunately, for best results, the move to ask for federal aid against grasshoppers was delayed and the hoppers had already done considerable damage before the bait was available. However, the allotment to Missouri, which was doubled by the addition of sawdust, saved thousands of acres of corn, for fodder and ensilage, the drouth largely preventing corn from producing any grain. The farmers of the State and those of us in charge of insect control work greatly appreciated the federal help in controlling the grasshoppers this year. While our campaign against grasshoppers has not been as effective as the one in 1934 against chinch bugs, it has helped save much needed forage and has sold grasshopper control work to Missouri farmers.

L. H.

The Grasshopper Situation in Colorado 1936. Sam C. McCampbell, Colorado State College. The extreme dry weather in many sections of Colorado caused grasshoppers to be unusually severe in their attacks on cultivated crops. The heavily infested portion of Colorado can be pictured by drawing a line thirty miles south of Denver, that would extend from the foothills east of the Continental Divide to the Kansas State line. The territory lying north of this line would represent the principal territory of this season's campaign.

About the first of August a flight, or several flights, of the long-winged migratory grasshopper, Dissosteira longipennis, came into Lincoln county. When this territory was visited August 15,

much of the grass land had been entirely eaten to the ground. Egg beds were found where eggs had been laid at the rate of 800 to 1600 per square foot. The advent of this hopper was so late in the season that a control campaign was not advisable but considerable control work was done by individual ranchers in this district.

This season's campaign was conducted along the same lines as campaigns of 1934 and 1935. The central mixing plant was operated under the direction of the county extension agents. Poison was mixed at cost and distributed to farmers with directions for its use. Jefferson county, located just west of Denver, topped the list mixing over 300 tons of dry bran and sodium arsenite. At this time over 1400 tons of dry bran for poison bait have been used. The formula used was the Colorado formula:

100 pounds of bran
1 quart of 8# sodium arsenite or
2 quarts of 4# sodium arsenite
3 ounces of amyl acetate
2 gallons of molasses
about 11 gallons of water

Six hundred tons of federal bran were a valuable supplement to the season's campaign. The remaining bran used in the campaign was purchased by the local mixing plants. Excellent results have been obtained where poison was distributed properly and farmers are more enthusiastic than they have been in the past over results obtained.

A mechanical bait spreader was found to be a great improvement over the old hand method of scattering bait and a demonstration machine visited all heavily infested counties, resulting in many spreaders being built.

It is interesting to note that in one section Acloplus turnbulli caused great damage to beets. This species did not feed in the customary grasshopper manner, but sheared the leaves of the beet close to the crown, consuming only a small portion of the destroyed leaf. A rather light population of this species proved capable of causing very serious injury.

The principal species involved in this season's outbreak were: Melanoplus differentialis, M. bivittatus, M. m. mexicanus, M. femur-rubrum, M. packardi, and M. lakinus. Late in the season Dissosteira longipennis became a major species in southeastern Colorado.

S. C. McC.

The Grasshopper Situation in Nebraska during 1936. L. M. Gates. Lincoln, Nebraska. The grasshopper outbreak in Nebraska in 1936 caused more serious and widespread damage than any similar outbreak since those of the Rocky Mountain locusts in pioneer times.

Although there was a supply of bait left from the 1934 campaign, this was soon distributed and many requests were received for additional help in combatting the pests. It was estimated that there was 355 tons of the mixed bait on hand at the beginning of the season; later, 1900 tons of bran and 19,000 gallons of sodium arsenite were furnished by the federal agencies. In addition to these amounts, many tons of bait were mixed and distributed by local organizations and paid for from private funds.

Seventy-one of Nebraska's ninety-three counties received bait furnished by the federal government. Some of the counties in northern Nebraska that suffered heavy losses from grasshoppers in 1934 were not seriously infested in 1936.

While most of the losses were caused by Melanoplus bivittatus and Melanoplus differentialis, there were severe infestations in eastern Nebraska of Melanoplus mexicanus. The latter species migrated into Nebraska from the southwest, heavy flights having been observed on several dates.

L.M.G.

Grasshopper Situation in Iowa 1936. C. H. Richardson, Iowa State College, Ames. The situation was the most serious in the West and South parts of the state. Melanoplus bivittatus, M. mexicanus and M. differentialis were the more important species. M. femur-rubrum did damage in localities. Sawdust-bran bait was used.

G.M.L.

The Grasshopper Situation in South Dakota, 1936. H. C. Severin, South Dakota State College, Brookings. The grasshopper situation in South Dakota on August 10, 1936 is unique, not because grasshoppers are threatening to destroy the cultivated crops over certain large areas in South Dakota, but because we have experienced a terrific increase in so-called range species of grasshoppers which are taking our native grasses.

The principal so-called cultivated crop species of grasshoppers which are giving us our greatest amount of trouble at the present time are the following:

Melanoplus mexicanus mexicanus (Sauss)
Melanoplus bivittatus (Say)
Melanoplus differentialis (Thomas)
Dissosteira carolina (Linn.)

The so-called range species which are so destructive to our native grasses especially on the range are the following:

Melanoplus mexicanus mexicanus (Sauss)
Philbostroma quadrimaculatum (Thomas)
Amphitornus coloradus (Thomas)
Aulocara elliotti (Thomas)
Ageneotettix deorum (Scudder)
Drepanopterna femoratum (Scudder)

Dissosteira carolina (Linn)
Trachyrhachis kiowi kiowi (Thomas)
Pardalophora haldemanii (Scudder)
Spharagemon collare (Scudder)
Metator pardalinus (Sauss)
Phoetaliotes nebrascenses (Thomas)
Aeoloplus turnbulli bruneri (Caudell)
Aerloplus turnbulli turnbulli (Thomas)
Melanoplus angustipennis (Dodge)
Melanoplus gladstoni (Scudder)
Melanoplus occidentalis occidentalis (Thomas)
Brachystola magna Gir.
Camnula pellucida (Scudder)

It should be emphasized that a range species of grasshopper is not always a range species, for very often it has been our experience that such species invade cultivated crops and do an immense amount of damage to such crops. Likewise so-called cultivated crop species may do much damage to our native grasses under certain circumstances.

South Dakota is experiencing one of its worst drought years at the present time. Over much of the state rainfall has been sadly lacking and this combined with high temperatures has had a disastrous effect upon cultivated crops and grasses. In certain areas there is not enough green food to satisfy the grasshoppers, with the consequence that the hoppers are even taking the grass growth of last year. We have had extremely high temperatures in South Dakota, and this fact combined with the lack of green vegetation has caused immense flights of grasshoppers into other areas. However, we have had extensive migrations out from areas where green vegetation was abundant and luscious but where temperatures were abnormally high.

H.C.S.

The Grasshopper Situation in Wyoming, 1936. C. L. Corkins, Powell, Wyoming. The central part of the state has had the most serious trouble, with Melanoplus differentialis species predominating. High ground temperatures in 1934 killed many hoppers in sections and had much to do with conditions being no worse than they have been.

G.M.L.

Montana Grasshopper Situation, 1936, Fred D. Butcher, U.S. Bureau of Entomology and Plant Quarantine. Grasshopper eggs started hatching in Yellowstone county, Montana, about April 20. By the first week in May, crop damage had started and control activities were inaugerated. By the third week in May, old supplies of control materials were exhausted in some counties and more bait was being secured to continue the control effort.

Under the leadership of Dr. H. B. Mills of the Entomology Department, Montana State College, county agents held a series of

educational meetings throughout the Yellowstone Valley. The writer assisted in several of these meetings. Control campaigns were continued or organized in most of the areas where the meetings were conducted and heavy crop losses generally prevented. The details of the organizations in the several counties were quite varied, ranging from no assistance by county governing boards, to furnishing all control materials to farm operators by the county. In nearly all cases the costs of control materials were divided about equally between farm operators and the county. This procedure tended to prevent individual farm operators from using excess quantities of bait.

Control efforts from Park County to Treasure County were successful in preventing crop losses. This was evidenced by the loss of sugar beets which was as high as 80% in areas where no control was attempted, to less than 5% where well-organized campaigns were conducted. Sharply reduced crop prospects--due to a drought--prevented efficient control campaigns in the eastern areas of infestation.

Throughout the area, M. mexicanus and M. bivattatus were the predominant species attacking the crops.

Additional materials for control originating from the Grasshopper Control appropriation and from W.P.A. sources, were brought into the infested area later in the season. Not all of these materials were used and there is bait in storage to be used next year.

A very interesting occurrence in connection with the control campaign was the organization, in several communities, of local committees which underwrote the costs of securing control materials and then sold the bait to farm operators at cost, on a cash basis. These committees were able to supply bait for the period of the campaign at low cost as compared with retail supplies and as many as 95% of the farm operators in these communities used control materials to protect their crops.

F. D. B.

North Dakota Grasshopper Situation, 1936. Fred D. Butcher, U. S. Bureau of Entomology and Plant Quarantine. The situation as outlined for eastern Montana applies to North Dakota. Young grasshoppers appeared later, however.

Control effort was just starting when the effects of the drouth made crops deteriorate so that control was not protecting a prospective harvest. Control which was attempted was effective. Reports from the state indicate that the survey predictions were fairly accurate.

F.D.B.

Grasshoppers in Illinois, 1936. J. H. Bigger, Ill. Natural History Survey, Jacksonville, Illinois. The grasshopper problem was new to Illinois farmers as a major factor in crop production. However, by demonstrations and wide publicity a control campaign was well under way in the state during the latter part of

June, 1936. Receipt and publication of word that a grant of Federal free bait materials was in prospect temporarily halted operations. Illinois received only 100 tons of bran and sufficient poison for this amount. By spreading this grant in small quantities over a wide area it was made to, and did, serve as an excellent demonstration. Much effective baiting was later carried on by our farmers. Baits made with bran, paris green, and a wetting agent of light fresh lubricating oil, gave very satisfactory results in Illinois and were widely adopted by our farmers.

J.H.B.

Monday, August 17, 7:30 p.m. C. H. Richardson presiding.

Grasshopper Control Campaigns. Fred D. Butcher, U. S. Bureau of Entomology and Plant Quarantine. Effective grasshopper control campaigns must be based on accurate information regarding the extent and intensity of infestations in the area. This can be supplied by accurate surveys. With accurate information, the entomological forces and Extension Services can proceed with the organization of campaigns. Necessary steps may be briefly stated as follows:

1. Advise farm operators of situation.
2. Organize county and community organizations to handle control activities.
3. Secure control materials.
4. Use bait to control grasshoppers.
5. Survey to determine infestation for coming year.

It is the responsibility of the entomologists to advise farm operators of grasshopper infestations. Farmers should not be expected to foresee the severity of infestations early enough to organize efficient campaigns and they may rightly assume that if entomological forces are not discussing grasshopper infestations that there is nothing about which they should be concerned. Educational meetings--district, county, and community--should present information in all parts of the area. These meetings should be conducted so that they coincide with the time farmers are making plans for the approaching season's crops and activities. When supplemented by news stories, radiocasts, and circulars, these meetings will advise farm operators of the kind of infestations expected.

Organizations to handle the local phases of control are needed. Recent experiences indicate that a state committee, with county and township or community committees cooperating, is a satisfactory type of organization. An outline of a successful statewide organization is as follows:

State Committee with State Leader
County Committees with County Leaders
    Mixing station foremen and crews
    Unloading and hauling crews
Township or Community Committees
    Bait Ordering chairmen
    Bait scattering crews
    Infestation scouts
    Farm operators

Care must be exercised that committee members are not appointed for the honor involved. There will be a job to do and only working committees should be involved. On the state committee an entomologist and the Extension Director should always be included. On county committees there should be a representative of the county governing board and the agricultural agent. Local committees should represent the several sections of the local areas. The several committees cooperate to secure control materials, establish facilities for handling them, and direct their distribution to farm operators. Financial responsibilities may need to be assumed by committees but they need not revert for settlement to individual committee members.

United effort of groups of farm operators in controlling infestations within the community will result in efficient control and be a saving to individuals in the group by preventing migrations and the necessity of extended control effort on their respective farms. Committees must assume the responsibility of having control materials available in time for efficient use. Generally 25% of the predicted requirements should be on hand when grasshopper eggs start hatching. Additional materials can be brought in as needed but should never be too long delayed. Committees will need to supervise bait distribution and keep records of its use. Wholehearted community effort will result in successful control by preventing crop losses and egg laying.

Grasshopper surveys, both adult and egg, will determine the extent of infestations developing for the ensuing year and are therefore the final seasonal activities of complete grasshopper control campaigns.

F.B.B.

Resume of Motion Picture Reel. F. A. Fenton, Oklahoma Agricultural College, Stillwater. The motion picture shows the damage to alfalfa, corn, cotton and trees caused by the grasshoppers. Of particular interest was the wide-spread defoliation of trees in the southwestern part of the state. Bois-d'Arc hedges, Chineberry trees and fruit trees were particularly sought. Elm seemed to be the last tree chosen for feeding. Close-ups show large kills of the grasshoppers by poisoning in cotton and alfalfa fields, hoppers roosting on the shady sides of fence posts and the different species. The methods of mixing and broadcasting bait were shown. The pictures are in color and show more plainly the devastation caused by the insects.

F.A.F.

Tuesday, August 18, 9 a.m. H. C. Severin presiding.

Jefferson County Grasshopper Poison Plant, L. G. Davis, Extension Agent, Arvada, Colorado. Information gained from fall surveys and the numbers of early hatching hoppers indicated that Jefferson County would have a severe grasshopper problem to contend with during the 1936 season.

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There was no indication that the government would furnish poison. A meeting of agricultural advisory committee and interested farmers furnished agent with authority to go ahead and mix poison at cost.

Plant was remodeled with installation of power mixer and best equipment available with money on hand, in order to turn out the greatest amount of poison with the least labor.

Three hundred tons of bran were contracted for, a foreman put in charge of the plant and a bookkeeping system set up to take care of the needs. Poison was furnished to Denver and Arapahoe Counties. When Government poison came in, a new set-up had to be arranged. Six hundred and twenty tons of poison were mixed during May, June, July, and August.

All demands were met, results were excellent with heavy vegetation, animal losses were negligible. The standard Colorado formula of bran, molasses, sodium arsenite, amyl acetate and water was used.

L. G. D.

Annual Grasshopper Survey, Robert L. Shotwell, Entomologist Bureau of Entomology and Plant Quarantine, Bozeman, Montana. The annual grasshopper survey conducted under the direction of the Bozeman Laboratory of the Bureau of Entomology and Plant Quarantine, is being developed according to the following plan and for the following purposes:

1. General Survey

To predict what might happen under the most favorable conditions and figure in advance, amounts of material needed and cost of control for states and counties.

Adult Survey

To locate in a general way the areas of infestation and determine the species involved.

Egg Survey

To make final check on conditions upon which predictions are made for the following year. Adult and egg surveys are conducted in cooperation with the states.

Nymphal Survey

A general survey is made during the hatching period to check on the predictions made the fall before, the progress of hatching and to record any natural agency which might be upsetting the predictions. This is conducted by workers in the Bozeman Laboratory.

2. Grasshopper Population Studies in Relation to Plant Associations.

Certain permanent collecting points are being established in each state where annual collections of grasshoppers are made. Major plant associations are considered, quantitative studies of these collections serve as an index to fluctuations of populations of the various species from year to year.

3. Extension Program

The purpose of the extension program is to cooperate with state agencies in control campaigns, point out the danger spots of infestation and assist in carrying the gospel of organized control.

General Survey Method

A method of making a grasshopper survey has been developed whereby the extent of an infestation is reduced to a mathematical basis, so that it can be used for determining in advance the amount of materials and the cost necessary for control in a county or state. Grasshopper populations are usually classified as "normal", "light", "threatening", "severe", and "very severe". By giving to these categories ratings from 1 to 5, and rating each stop made in the course of the survey according to the degree of infestation found there, on the basis of the number of grasshoppers found per square yard and of egg pods per square foot, etc., it is possible to compute the percentage of infestation for that stop and the average percentage of crop acreage involved for the entire county. By taking this percentage of the total grasshopper-susceptible crop acreage of that county, the acreage to be poisoned is obtained. The amount of poisoned bait required is computed at the rate of 10 pounds (dry weight) per acre, and the cost figured from the prevailing prices. This is done as follows: Total crop acreage (grasshopper-susceptible) x percentage of infestation = crop acreage involved x 10 lbs. bait (dry) per acre = tons of bait needed x $25.00 per ton = cost of control.

The expression, total crop acreage, must be qualified to meet limitations of infestations in crops and differences in conditions found in the various parts of the territory. In many crops the infestations are at first restricted to field margins and the quantities of bait necessary to cover one-half to one-fourth the whole area of the field is usually sufficient to go around the edges about three times, depending on the type of the field. The menace of any given infestation is less under humid than it is under arid conditions for natural mortality is greater under the former and vegetation is more lush which tends to hold greater populations a longer time. Farming in the more arid sections is on a bigger scale involving larger fields and cultivated crops surrounded by neighboring tracts of idle lands or grazing areas.

Migrations from these adjoining uncultivated areas increase the amount of control necessary to protect crops from any given infestation.

Rating Infestations

Allocation of factors:

The following table is used for the rating of each stop remembering that it acts as a guide and other factors such as damage, previous history, etc., may have a little influence on the rating. As you go along you will find yourself rating impressions. Decimals are used for those infestations which come in between the classifications. It is very difficult to reduce egg pod counts to so many per square foot under the great variety of egg-laying places so one's judgment must be relied on to form a correct impression and opinion of the degree of infestation in any one field. In small field areas where the land is very much cut up into small farms the irrigated field columns are used for rating. In large field areas the non-irrigated columns are used.

Number of Live Hoppers and Egg Pods Which Determine the Rating of an Infestation

Infestation Rating		Live Hoppers per Sq. Yd.				Egg Pods per Sq. Ft.			
		In fields		At field margins and roadside		In fields		At field margin and roadsides	
		Non-Irrig.	Irrig.	Non-Irrig.	Irrig.	Non-irrig.	Irrig.	Non-irrig.	Irrig
Normal.....	1	1	2	4	3	.25	.5	2	1
	1.5	1.5	3	6	4.5	.375	.75	3	2
Light.....	2	2	4	8	6	.5	1	4	3
	2.5	3	6	12	9	.75	1.5	12	7.5
Threatening....	3	4	8	16	12	1	2	16	12
	3.5	6	12	24	18	1.5	3	24	18
Severe.....	4	8	16	32	24	2	4	32	24
	4.5	12	24	48	56	3	6	48	36
Very severe....	5	16	32	64	48	4	8	64	48

Method for Determining Percentages of Crop Acreages Involved

In order to determine the amount of material necessary to control an infestation, the ratings are changed to equivalent percentages of grasshopper susceptible crops. The five ratings, their names and conversions to percentage of crop acreages involved are as follows:

Degree of Infestation	Rating	Percentage of Crop Acreage Involved
Normal	1	0
Light	1.5	5
	2	10
Threatening		20
	2.5	25
		30
	3	40
		50
Severe	3.5	55
		60
	4	70
		80
Very severe	4.5	85
		90
	5	100

The ratings for each stop are converted into precentage of infestation and, from tabulations of all the stops in a county, the average is derived for all the counties.

After the surveys have been completed, the data is compiled and complete reports furnished each state of the conditions found there which include estimates of quantity and cost of needed control material.

R.L.S.

Some Observations and Remarks upon the Foods of Grasshoppers. H. C. Severin, South Dakota State College, Brookings. It was suggested by the program committee that Mr. H. C. Severin discuss the ecology of grasshoppers. Since, however, this is such a large subject, Mr. Severin stated that he preferred to confine his discussion to some observations and remarks about the foods eaten by grasshoppers.

In South Dakota occur 110 different species and varieties of grasshoppers. The range of each species and variety has been determined under normal conditions, but it has been found that the ranges are not always fixed or unvarying, but that the boundaries of the ranges vary with changing climatic conditions. If such changes extend over a period of years, not only does the floral complex of the environment take on a changed complexion, but the grasshopper fauna does likewise.

Before the white settlers came to South Dakota and put in their crops and before any of the later introduced weeds had made their way into the state, we undoubtedly had the same species and varieties of grasshoppers in our commonwealth that we now have. However, all the species and varieties were compelled to feed upon the plants which were then present. The various species and varieties of grasshoppers did not have the same food preferences, but each had its preferred food plant or plants which it ate in preference to anything else. Even at the present time we still have quite a large list of species of grasshoppers that feed upon one or at most a few closely related plants that were native to South Dakota, and strange to say,

they do not under ordinary circumstances feed upon introduced or cultivated plants.

A number of species and varieties of grasshoppers were then named to illustrate this group, and in each case the food plants preferred were listed.

Other species and varieties of grasshoppers had a more extensive list of food plants which constituted the preferred food. Such lists of plants varied with the species or variety of grasshopper concerned. Some of these species of hoppers were able to feed upon cultivated crops when they were brought in by the settlers and, at times, the cultivated crops were preferred by the hoppers to the native species of plants.

Species of grasshoppers were then named to illustrate this group of hoppers, and both the native and introduced preferred food plants of each species were indicated.

In this connection it should be emphasized that when an injurious grasshopper begins to get scarce, specimens of that species may always be found in the environments of the habitats where the native food plants grow. Such areas especially act as reservoirs from which outbreaks originate.

It should also be stated that most species of grasshoppers feed not only upon preferred foods but they will also take foods to which they are indifferent when the preferred foods are available. Further, when their preferred foods are absent or scarce, they will take foods which under ordinary circumstances they absolutely shun. Just what immediate effect the various non-preferred foods have upon the grasshoppers, especially so far as reproduction is concerned, we do not know. Neither do we know what ultimate effect such non-preferred foods will have upon the grasshoppers if they are forced to feed upon such foods several years in succession.

H.C.S.

Discussion points: - Many hoppers do not need green food to survive, may be breaking down carbohydrates for moisture. Delayed hatching may be due to lack of moisture or in some cases to a second brood. Many sorghums are fairly resistant to hopper injury. Miloes eaten more. All Milo and sorghum hybrids do not act alike. Grasshopper resistance not correlated with chinch bug resistance. Often in badly injured fields of corn individual plants show less injury. Time of planting or maturity may influence injury. Huge appropriations for grasshopper control should not be necessary. Catch outbreaks in early stages.

Intensive Area Studies. J. R. Parker, U. S. Bureau of Entomology and Plant Quarantine, Bozeman, Montana. This was an outline of the intensive studies being made on certain carefully selected areas in different regions. First area in Centennial Valley, Mont. where Camnula pellucida occurred, normally on island of Poa among Cares and Juncus then these foci moved out into the Cares and Juncus and formed foci for larger invasions. A survey could have missed

these spots. A cheap direct method was to work on these spots. Four intensive study areas are maintained in Montana, three in South Dakota and one in Minnesota, with locations where former outbreaks have been suspected to start. These are visited at least four times each year to make spring egg survival surveys, nymph, adult, and egg pod surveys on at least each quarter section. Areas being mapped according to plants injured and plant associations. Emergency control work has seriously interferred with research work of Bureau.

G.M.L.

Poisons for Grasshopper Baits. C. H. Richardson, Iowa State College. Laboratory studies of poisons for grasshopper baits were begun in the summer of 1931 with Melanoplus femur-rubrum and M. differentialis. They were continued during 1932 with M. differentialis and were revived again this year (1936) with M. bivittatus as the test grasshopper.

Thirteen compounds have been tested in a standardized bran-molasses-water bait, the bait being administered to the grasshoppers by an individual feeding method. Among the more effective of the compounds tested are: As_2O_3, sodium arsenite, Paris green, Cuprous cyanide, sodium fluosilicate, barium fluosilicate, sodium fluoride, and zinc phosphide. The compounds of lowest toxicity are: Acid land arsenate, rotenone, nicotine tannate, and phenothiazine. Sodium fluoaluminate is probably less toxic than the other fluorine compounds examined.

C.H.R.

Tuesday, August 18, 1:30 p.m. Leonard Haseman presiding. Symposium of Taxonomests.

The Diptera of the Florissant Miocene. Maurice T. James. Colorado State College. A study has been made of certain families of Diptera from the Florissant Miocene shales, with special reference to the Bibionidae and Asilidae. The Bibionidae were much more numerous in the Miocene of Colorado than today, though the genera, and, to an extent, the species, are similar. The Asilidae are such as we might expect to find today in East Texas. The Miocene was placed in geological time as perhaps 20,000,000 years ago, and a brief account of the mammals of that time was given, for the sake of comparison.

M.T.J.

Staphylinids - R. Voris, Southwest Missouri State Teachers College, Springfield. My interest in the group is concerned with their behavior, distribution and taxonomy. In the past few years I have worked a number of life histories in the family and especially in the Genus Philonthus. At present I am attempting to correlate my taxonomy of the larval forms with the taxonomy of the adults. It is hoped that this series of studies will result in a complete revision of that genus and eventually a revision of the entire subfamily.

As the larva cannot be considered in the same light as the vertebrate embryo we cannot consider them as forms more primitive

than the adults but rather as a more highly evolved form. In the past we have used certain rather obvious marks on the adult to separate the various sub-genera and have unconsciously considered these subdivisions as biologic subdivisions of the Genus. The taxonomic picture as presented by the larvae could not be forced into this mold and this will in turn force us to reconsider the relationships of many of the species (of adults) within the Genus.

In addition to this purely taxonomic interest in the group we have a chance here to study the geographic distribution of a strong flying, predaceous beetle. How these distributional lines will correlate with the present life-zone lines is not known but it is hoped that before the revision is completed that we will be able to get together enough specimens from a large enough number of localities to give us a working knowledge of the application of the laws of distribution to strong flying insects .

R.V.

Syrphidae, Elizabeth Heiss, Colorado State College, Fort Collins.

Notes on the Family Bombyliidae (Diptera). R. H. Painter, Kansas State College. There are about 500 described North American beeflies and probably at least half again as many undescribed ones. Through a period of about fifteen years it has been possible to get together a collection of most of the described species and many undescribed ones, and to see all types available in North America. The family is being studied one genus or group of species at a time. Among several genera it is difficult or impossible to make identifications until species are restudied comparatively. In some genera the male genitalia are useful.

Many of the adults feed on pollen and nectar. Some are usually found resting on bare ground, wood, or leaves in the sun. Two types of body forms are common in the family. The Bombylius type has a long proboscis and short body thickly clothed with hair; the Villa type has a short proboscis and a body clothed with scales. Several genera are intermediate in general appearance. The larvae are parasitic or predacious; some feed in the egg pods of grasshoppers, others are internal or external parasites of larvae of other orders of insects.

R.H.P.

Notes on the Family Apioceratidae (Diptera) R. H. Painter, Kansas State College. In 1930 and 1931, over a hundred specimens of the genus Apiocera were collected. Previous records in the literature consist of the description of the two type males of two species. In 1932 the two older species were redescribed and a new species from the White Sand of New Mexico added. Only sixteen species were known in this family for the whole world. Since 1932 ten additional species of the genus Apiocera have been collected. These will be described in a paper now in press. The family is found usually in the semi-arid regions and mostly in North and South America and Australia. One species is known from South Dakota. The females of Apiocera are difficult to separate into species, the males are easily identified by the structure of the male genitalia and the pattern on the abdomen.

R.H.P.

Effectiveness of Certain Devices in Illustrating. Miriam A. Palmer, Colorado State College. Illustrating entomological specimens is really drafting on account of accuracy demanded. Turning a photograph into a pen and ink drawing serves the purpose of absolute accuracy and at the same time gives definiteness and clearness of details with reduced printing cost. Method used was published in Science Jan. 2, 1931, and additional hints in Science, Vol. 73, No. 1895.

The photograph is traced with india ink then the photographic image is removed and the paper bleached.

Figures with measurements attached, if these characters are not repeated in the text, serve to aid brevity in descriptions and at the same time greatly facilitate study.

M.A.P.

Orthoptera, H. H. Henderson, Utah State College, Logan. Dr. Henderson gave a discussion of some of the problems confronting one working on this group.

Some Plant Lice of the Sugar Beet, A. C. Maxson, Great Western Sugar Co., Longmont, Colorado.

Need of Keys for the Common Insects of the Rocky Mountain Region, John W. Scott, University of Wyoming, Laramie. There are some monographs on a few groups of insects, but there are no adequate keys to most of the hundreds of common species of insects in this region. While some species are readily identified, satisfactory keys would add much to the study of entomology in this part of the country.

Tuesday, August 18, 8 p.m. H. C. Severin presiding.

Address of Welcome. A. G. Crane, President University of Wyoming, Laramie.

Geology of the Rocky Mountain Region, S. H. Knight, Professor of Geology, University of Wyoming, and Director of Summer Camp. The Rocky Mountain Region was once a lake or sea. Deposits of millions of years can be seen. Birth of the mountains was probably 60,000,000 years ago. Dr. Knight illustrated with colored crayons how the Front Range and Medicine Bow Range were formed. The oldest rocks are found on the highest mountains.

Wednesday, August 19. Hike Day.

Thursday, August 20, 9 a.m. J. R. Parker presiding.

Alfalfa Weevil Developments in Nebraska in 1936. L. M. Gates, Lincoln, Nebraska. The alfalfa weevil is now known to be established in Nebraska in western Scotts Bluff County and in northern Sioux County. Also a few specimens have been taken in one field in Dawes County adjacent to the Sioux County infestation, and two fourth-stage larvae were taken in an alfalfa field in Box Butte County approximately twenty-five miles from any other known infestation. The population of weevils in Scotts Bluff County is extremely light and no damage has been reported. In northern Sioux County the weevil population is much heavier and damage was noted last year by the ranchers of that area. These two locations are separated by about sixty miles of grazing land in which practically no alfalfa is grown, but both of them join Wyoming counties that have been known to be infested for some time.

No control methods have been used, although the ranchers in Sioux County have been urged to cut their first alfalfa hay crop early. Alfalfa seed has been produced quite extensively in this locality in recent years, and conditions have, therefore, been more favorable here for the development of the weevil than in Scotts Bluff County where practically no alfalfa seed is produced and irrigation farming is highly developed.

All four of the Nebraska counties infested by the alfalfa weevil have been placed under quarantine in conformity with the practice of the Plant Boards. The Bureau of Entomology and Plant Quarantine has been making a study of the alfalfa weevil under Nebraska conditions during the past season.

L.M.G.

Codling Moth Situation in Virginia, W. J. Schoene, Virginia Agriculture Experiment Station, Blacksburg. Prior to 1930 the fruit growers in Virginia experienced very little difficulty with the codling moth. Subsequent to that time the regulations of the Food and Drug Division regarding arsenical residue combined with dry weather have brought about a condition that made heavy losses possible. The growers in Virginia have been slow to adopt the washing machine, but those who have adopted the washing method and have applied the late sprays carefully have in general held the losses to a minimum. The growers who did not adopt a

washing program have usually discontinued spraying early in the season with a result that the codling moth losses have been severe except in some orchards. The method of handling the apples in the orchard at picking time is often favorable to a heavy carry-over of worms in the orchard and where the apples were packed in the orchard more difficulty has been experienced with worms.

Research work during the past few years has been directed along two lines; first, the residue removal, and second, the testing of substitutes for arsenate of lead. A good many observations have been made on the effectiveness of these washing machines in the removal of spray residue and also the keeping qualities of the apples after they have been washed. The work with substitute sprays has consisted of testing various nicotine combinations, applications of oil, and calcium arsenate. In conclusion, the most satisfactory control for the codling moth at present consists in the application of four or five arsenate of lead cover sprays and then removing the residue with an acid washer.

W.J.S.

Influence of Weather on the Codling Moth, L. Haseman, University of Missouri, Columbia. High temperature and a scarcity of rainfall favor the codling moth, providing the temperature and lack of moisture are not so great as to actually prove a detriment. In 1934, the midsummer heat and drouth were so intense as to practically stop codling moth breeding for a time. The same was true in 1935 and again in 1936. Each of these years the pest suffered a real setback by the weather, though it was able to partly restore its populations by heavy early and late breeding when the temperature was more to its liking.

In the same way the extremely low winter temperatures of 1935-36 destroyed a very large percent of the hibernating worms which were exposed above the snow line. This followed by heavy rainfall in the early part of 1935 greatly aided in reducing the number of first brood worms that year. In Missouri the codling moth has not been able to rebuild its populations back to the 1933 high, due in large part to the past three abnormally hot and dry summers and cold winters and the cold wet spring of 1935. As a result, our growers generally have the codling moth problem much better in hand than was the case in 1932 and 1933. We still have plenty of moths and too many wormy apples but the pest seems decidedly on the mend in our State.

L. H.

Spray Residue Removal, C. L. Fluke, University of Wisconsin, Madison. Where less than four cover sprays of arsenate of lead are used excess residue on apples may be removed before harvest by spraying with sodium silicate and after this has dried follow with a spray of clear water.

G.M.L.

Codling Moth Control in Colorado, J. H. Newton, Paonia, Colorado. A quick breaking kerosene emulsion used with the arsenate of lead gives a heavy deposit. Casein and lime give a very uniform but thin deposit. Petricide, a new material similar to the quick breaking emulsion, gives a good deposit and acts as an ovicide. Phenothiozene often gives some leaf burning.

G.M.L.

Codling Moth in Indiana. J. J. Davis, Purdue University Lafayette. The cold wet spring of 1935 greatly reduced the infestation. More trouble is being experienced in 1936. Hail injured apples are complicating the problem. Problems being worked on - light traps, types of traps, intensity of light, types of water in relation to amount of spreaders to use and practices of control in addition to the use of insecticides.

G.M.L.

Peach Mosaic Control - Max A. Sisson, Bureau of Plant and Insect Control, Grand Junction, Colo. Peach Mosaic is a virus disease of peach which has produced destructive effects on peach orchards in the Palisades district of Colorado. It was first recognized in that area as peach mosaic in the fall of 1934.

Symptoms of the disease are first noticed in early spring. A badly infected tree at that time will show pronounced mottling and crinkling of new leaves. The mottling tends to follow the midrib and veins of the leaves and is characterized by a clearing out of those areas making them transparent. The whole tree at this time is readily distinguished from a normal tree by the retarded leaf growth. Other symptoms are noticeable in midsummer. These symptoms are a shortening of the new growth producing a witches broom effect and a clearing out of tiny veinlets on older leaves producing what is known as flecking. Mottling is not as pronounced at this time as it is in early spring. The final symptom, noticeable as the fruit starts to mature, is the bumping and ridging of the peaches, especially on badly affected limbs. The flesh is coarse textured and flat tasting.

A well organized eradication campaign is now in progress in the Palisades area. This project is organized through cooperation of local, state and federal departments. Local men are used as scouts to locate and mark trees for removal. These men are organized in crews of 4 each. After they have located and marked the trees, the removal crew of W.P.A. laborers grub the trees and burn them.

A marked reduction in the amount of the disease in the Summer of 1936 from the Summer of 1935 is noticeable at this time due to the complete cleaning out of the disease from orchards through the spring and summer of 1935. There are about a third of the number of diseased trees removed at this time this summer as there was at the same time in 1935. This shows that the spread of the disease has been checked and that we can expect an even greater reduction in 1937.

Some work has been done to determine the vector of the disease which by a process of elimination is supposed to be an insect. Numerous transfers have been made of various species of insects common to the infected area. As the incubation period of the disease is 8 to 10 months, in budding and grafting transmissions, some time will have to elapse before results can be noted.

M.A.S.

Work of the Inter-mountain Bee Laboratory. A. P. Sturtevant, U. S. Bureau of Entomology and Plant Quarantine, Laramie, Wyoming.

Bee Behavior in Commercial Production. C. L. Farrar, U. S. Bureau of Entomology and Plant Quarantine, Laramie, Wyoming.

Thursday, August 20, 1:30 p.m.

Extension Projects and Training Local Leaders. E. G. Kelly, Kansas State College, Manhattan. It is a working leadership that accomplishes! That phrase expresses the thoroughness by which the insect pests attacking the crops of Kansas are combatted with timely scientific remedies by trained, unpaid leaders to prevent complete, and, in many cases, even partial destruction of growing crops.

Defined in more definite terms, the objective in training entomology leaders is to insure trained individuals in each community who may teach natural history, demonstrate insect control practices, and assist the entomologist in making surveys of insect pests.

Some of the important insect population surveys made by leaders have included grasshoppers, chinch bugs, Hessian flies, and garden pests. Leaders send reports of the records to the Extension entomologist for analysis.

There are now 103 organized farm bureaus in the 105 Kansas counties. It is from the officers of these farm bureau organizations that the county entomology committees are selected. They are chosen by the county agents cooperating with the Extension entomologist. The community local leaders are then selected by the county agents, the Extension entomologist, the entomology committee, and officers of the local county farm bureaus. These local leaders represent their respective communities in all of their entomology activities.

Several times each year the extension entomologist meets with his leaders. There are leader-training meetings, usually held during the winter months when rural people have the most time to study. Later, field trips are made to collect and study certain pests and demonstrate control methods for them.

Here is an illustration that is typical:

It is about April 1. Only a few weeks, about the middle of May, and the chinch bugs will be migrating into the cornfields. It is time to demonstrate the building of a creosote-cyanide barrier. All leaders meet at a central place in the county. And here they are informed how to construct the barrier. Then, following the leader-training demonstration, demonstration barriers are built by the leaders on their own farms for the inspection and benefit of their immediate neighbors.

Then in the fall, summary and achievement meetings are held. Here the leaders demonstrate insect control methods, make reports of results of control practices and list the number of farmers following these practices in their communities. This is the source of information included in the regular annual reports prepared by the extension entomologist.

The entomology extension program is subdivided into five subprojects for the convenience in teaching local leaders and in reporting results. They include: Staple crop insects, horticultural insects, livestock insects, building and lumber insects, and insects of importance to the household and in sanitation.

In former years when it was necessary to take five or six years to train the leaders in a county, the plan did not permit the entomologist to reach the counties in the state as frequently as was desirable. Recently, the project plan was reorganized so the leaders may receive training from the entomologist for three successive years, after which they may continue to be project leaders as long as they wish.

E.G.K.

Lygus Bugs in Relation to Alfalfa-Seed Production in Utah. C. J. Sorenson, Utah State College, Logan. During the past ten years heavy infestations of Lygus bugs (Lygus hesperus and L. elisus Van D.) have been known to occur in the alfalfa-seed fields of Utah. Results of recent investigations by the Utah Agricultural Experiment Station indicate that these insects interfere with seed production in proportion to the intensity of infestation and that damage results to the alfalfa plant as follows:

(1) Buds are blasted; (2) "stripping" of flowers is increased; (3) the amount of shivelled seed is also increased, and (4) the vegetative growth is reduced. Both nymphs and adults cause injury.

Life history studies have been made and control methods investigated.

C.J.S.

Work with the Lygus Bugs in Arizona. L. L. Stitt, U. S. Bureau of Entomology and Plant Quarantine, Tempe, Arizona. Work started in 1935. Consists largely of field and population studies.

They cause much "flower slip" in alfalfa. Lambs quarter and mustard serve to build up the population.

G.M.L.

The Tomato Psyllid on Potatoes. L. B. Daniels, Colorado State College. The insect is being successfully controlled on potatoes with liquid lime-sulfur. The same applications are giving good control of the potato flea beetle when zinc arsenite is added.

A list of the more common wild host plants of the state was given. The psyllid was found in hibernation on Evergreen trees near Scotts Bluff, Nebraska, during the early spring.

G.M.L.

The Tomato Psyllid in Relation to Tomatoes. Geo. M. List, Colorado State College. The liquid lime-sulfur spray as used on potatoes burns the foliage and retards growth of the tomato. Sulfur dusts and wettable sulfur sprays show promise in control of the insect without any apparent injury to the tomato plant.

The Mormon Cricket Problem. C. L. Corkins, Powell, Wyoming. The Mormon cricket has been known since Brigham Young's day. They have been a very serious problem in several western states. Due to their migratory habit they can not be controlled by individual effort. Their egg beds usually do not cover 5% of a region occupied by the insect. They cluster in response to both low and high temperatures, in clumps of sagebrush and buckbrush. They are erratic feeders both as to time of day and foods taken. Poison baits do not give satisfactory control.

Sodium arsenite dust 20% with hydrated lime 80% gives best control. Control campaigns must be organized and ready to go very early as eggs may hatch early in March.

Rise of the Mormon cricket in last 5 years has been very spectacular. In sections not only have crops been destroyed but streams polluted, houses invaded, clothing and curtains eaten. Towns and farms are protected by tin fences. In Idaho one tin fence is 40 miles long. Rise of population can not be connected either with climate or parasites.

G.M.L.

The Squash Bug. J. L. Horner, Colorado State College. Dry pyrocide 1 part to fine gypsum 6 parts, kills many squash bugs and keeps them off plants for 1 1/2 to 2 days.

Blister Beetles in South Dakota. H. C. Severin, South Dakota State College. Injury from blister beetles usually follows grasshopper outbreaks. Some 30 or 40 species are injurious in the adult stage. When scarce they have food preferences but when abundant scarcely a tree or plant is exempt. Three species, the ash grey, the spotted and the striped, have been studied. Their life histories are similar. The life cycle was outlined and the different stages

described. Dusting with barium fluosilicate one part, hydrated lime 1 part and low grade flour 3 parts, gives good protection against the adults.

G.M.L.

Remarks on Some Aspects of Mosquito Control. Wm. B. Owen, Department of Zoology, University of Wyoming. Measures employed in the control of mosquitoes should be based on the same scientific principles as those utilized in combating any major insect pest. A knowledge of the bionomics and habits of the species involved is a consideration often overlooked. Indiscriminate drainage and oiling is not only wasteful but scientifically unsound. These measures should be employed only after a preliminary study has been made to determine what species are the chief offenders and where the larvae of these are to be found. The probable effects on the wild life of the area should be taken into account where drainage is to be utilized as a control measure.

W.B.O.

Thursday, August 20, 7:30 p.m. W. J. Schoene, presiding.

The Resistance of Crop Plants to Insect Attack. R. H. Painter, Kansas State College, Manhattan. The talk on Resistance consisted principally of the exhibition of a number of slides showing difference in insect attack and damage to different varieties, selections and hybrids. These examples have been secured during the last ten years while the resistance of crop plants to insect attack was being studied under a cooperative project between the departments of Entomology and Agronomy of Kansas State College and the United States Department of Agriculture. The slides showed differences in grasshopper injury to corn, in pea aphid injury to alfalfa, in chinch bug injury to corn and sorghums and in Hessian fly injury to wheat. The pictures showed that the difference was very clear between resistance and susceptible segregates from crosses between resistant and susceptible parents. Certain hybrids were injured, as was the susceptible parent, while others were like the resistant parent. This sometimes meant complete destruction for the susceptible sorts by the particular insect involved.

Six important purposes, or the place, of an insect resistance project may be stated somewhat as follows:

1. The entomologist should know and take advantage of differences in injury by various insects among the common varieties of crop plants.

2. By selection it may be possible to get strains of common varieties more resistant to insects and by hybridization it is possible to combine resistance with other agriculturally desirable qualities.

3. Occasionally resistance may provide a major means for the control of an insect. Frequently it can and should be used as a supplementary control.

4. The entomologist should know the characteristics, and work against the distribution of varieties more susceptible than those currently grown.

5. It is possible to learn more about insect habits and reactions against a background of plant varieties which differ in susceptibility to their attack.

6. All entomologists should use the major insect outbreaks to pick up and put on record information regarding the comparative resistance of varieties and of individual plants.

R.H.P.

Enemies of Fish in Yellowstone National Park. J. W. Scott, University of Wyoming, Laramie. This was an evening lecture, giving a popular account of extensive experimental work on the parasites of Salmo lewisi, the Yellowstone Lake trout. Bears are fond of fish and catch a good many while the trout are making their spring runs up the small streams to lay their eggs. White pelicans also capture many fish at this season, and the very rapid growth of the young pelicans is due to the rich nutritious food. At first the young are fed partially digested regurgitated food, but a young pelican six weeks old, weighing eight or nine pounds can take a fish fifteen inches long weighing one and one-half pounds. The California and Ring-billed gulls take some fish, but they are chiefly scavengers. Larval stages of certain tapeworms are found among the viscera and occasionally in the flesh of the trout. These belong to the genus Diphyllobothrium; one species, cordiceps, develops into the adult stage in pelicans and gulls and two other species, not yet named, develop in the Black and Grizzly bears. The adult tapeworms produce eggs which escape with the feces of the host. If the feces fall into water they are taken up by a copepod, probably Diaptomus, in which they develop into a procercoid. Copepods serve as food for trout, in which the second larval stage, plerocercoid, develops. Spent and heavily parasitized fish are slower in movement and are more frequently caught than active fish, especially by pelicans and gulls. A copepod parasitic on the fins is relatively harmless. Specimens of various parasites were shown.

J.W.S.

A short business session was held Thursday afternoon. The following report of the resolutions committee was made and adopted.

Whereas the 13th. Annual Rocky Mountain Entomologists's Conference has enjoyed a most profitable conference and outing as a result of the exceptionally fine facilities provided by the University of Wyoming and arrangements made by the University scientists and the officers of the conference,

Be it resolved that we express our sincere and deep appreciation,

1. To the University authorities who made available the University of Wyoming Summer Camp.

2. To Dr. A. G. Crane, Dr. S. H. Knight, and Dr. J. W. Scott, for their words of welcome and useful talks on the natural and geological history of the region.

3. To Dr. S. H. Knight, in charge of the University Camp and his assistant, Mr. F. C. Davis, for the innumerable courtesies extended.

4. To the officers of this conference for their untiring efforts in arranging the details of this conference.

5. And last, but not least, to the known and unknown fishermen who were responsible for the enjoyable trout meals.

Be it further resolved that we extend to our president, Dr. C. P. Gillette, our sincere regrets that ill-health prevented his attendance at this meeting and that we extend to him our best wishes and hopes for his improved health.

Respectfully submitted

J. J. Davis
J. C. Hamlin
E. G. Kelly

The nominating committee nominated the following for officers. Their report was accepted.

C. P. Gillette, Chairman; Claude Wakeland, Vice-chairman; Geo. M. List, Secretary, and C. R. Jones, Treasurer.

It was voted to assess each entomologist present 50¢ to cover postage and other expense of the Secretary. The selection of the time and place of the next meeting was left with the officers.

From the Collecting Net

The University of Wyoming Summer Camp proved to be an excellent place for the meeting. Many preferred the cabins for sleeping quarters over the large bunk house at Pingree Park.

The children, under the guidance of Margaret and Willena Schoene and Adelaide and Jeannette Richardson, had a very pleasant week.

The ping pong tables in the lodge in a way took the place of the minature golf course at Pingree. They probably would not if Professor Geo. A. Dean had been present.

C. H.Richardson and family spent a week at the University Camp after the Conference, "just hiking and resting."

Prof. and Mrs. J. J. Davis visited in Idaho before the conference and in New Mexico after it.

One criticism of the Wyoming Camp was that with all help supplied there were no K.P. duties to be assigned.

Wednesday was given to collecting, fishing, hikes and even trips to the hair dresser in Laramie.

Many thought the collecting in the vicinity of the Camp was not as good as in the open park region of Pingree.

The Wyoming camp is located among large spruce and fir trees, in fact, one tree almost three feet in diamter grows through the center of the dining hall.

One has only to see the versatility of Dr. S. H. Knight, Director of the camp, as he handles the ax on the logs, the boys in building cabins, and the colored crayons in his lecture on "origin of the Rocky Mountains," to realize what has made the camp such an important factor in the life of the University.

Donald A. Wilbur, Vice-chairman of the Conference, took sick while on his way to the meeting and had to return home. His presence was much missed especially in the absence of Dr. Gillette, the chairman.

After the Conference Dr. and Mrs. Severin drove west to Salt Lake, then north through Ogden, Logan, Pocatello, Idaho City and across into the Tetons, from there through Casper, Lusk, and the Black Hills. The only trouble experienced was with "vapor lock" in their car.

The children's party and treasure hunt Thursday afternoon nearly broke up the entomological meetings. Possibly the elders wanted to help supervise.

"Lights out" at 10 p.m. interferred with many card games and brought out the candles.

Fish caught on Wednesday and those held in the ice box by the Wyoming University people gave all some 3 or 4 meals of this delicacy.

Dr. Knight and about 20 of his boys were busy building a new botany laboratory and more cabins. In several instance visitors moved into cabins while the hammers were still busy. They were almost built while you waited.

Dr. C. L. Fluke and family visited his old home sections in Western Colorado before the meetings.

Dr. W. J. Schoene and family visited in Lander, Wyoming, Yellowstone Park, Salt Lake City, Grand Canon and Texas Centennial before returning to Virginia.

The children who furnished a part of the Thursday evening entertainment under the direction of Miss Willena Schoene, were Veda Hoerner, Donna and Rosemary Daniels, Howard Richardson, Samie McCampbell and Jessie Haseman.

It was the general opinion of those that had attended previous conferences that the Wyoming Camp and Pingree Park each have certain advantages as meeting places. The Colorado group appreciated being in camp without all the responsibilities of supplying meals, bedding, etc.

Geo. M. List, Secretary.

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